RSES & Elsevier eLearning – Course Outline

Refrigerant Usage Certification preparation – EPA Section 608

Course Title: Refrigerant Usage Certification preparation – EPA Section 608

Designed for service technicians, this course prepares certification candidates to pass each of the four question groups (Core, Type I, Type II, Type III) contained within the EPA Section 608 certification examination.

- CEUs: 10
- Course length: Approximately 8-12 hours
- User can stop and start the material at any point (e.g., after 20 minutes), bookmark where they leave off, and repeat all material as many times as desired.
- Price – Full course: $225, $150 for RSES members (£112 / £75; €150 / €100)
- Course uses Inch-Pound (I-P) units of measure.
- NATE CEHs: 10 - NATE-recognized for NATE recertification

Designed For:

- Service technicians

After Completing This Course, You Will Understand:

- Ozone-depletion
- The characteristics of refrigerants and the laws related to refrigerant usage
- The concepts of “recover,” “recycle,” and “reclaim”
- The procedures used to “recover,” “recycle,” and “reclaim” refrigerants
- The safety considerations and guidelines for using and handling refrigerants and refrigerant cylinders
- The process and techniques for repairing small appliances refrigeration systems
- The process and techniques for repairing high-pressure and very high-pressure systems
- The process and techniques for repairing low-pressure systems

Course Description:

- On-demand, interactive course of 4 modules (“short courses”)
- Online course reader with easy-to-print PDFs
- Online self-assessment
- End-of-module exam and certificate of completion

Modules:

1. Refrigerant Usage Certification
2. Type I: Small Appliances
3. Type II: High-Pressure Systems
4. Type III: Low-Pressure Systems

Every Module Includes:

- Module introduction
- Topic introduction

- Check-point questions
- Topic summary
- Assessment

Outcomes: The 4 online modules help you to understand:

- The understanding necessary to pass Core group
- The understanding necessary to obtain Type I certification
- The understanding necessary to obtain Type II certification
- The understanding necessary to obtain Type III certification

How This Course Relates to Existing RSES Training:

This online course is a great complement to the instructor-led trainings being offered by RSES Chapters.

The content of this Refrigerant Usage Certification online course and modules most closely resembles the “Refrigerant Usage Certification: A Study Guide for Service Technicians,” as well as the “Refrigerant Usage Certification Instructor Power Point CD,” however, the online course or any of the “Type specific” modules (e.g., Type I, Type II) in it can be used to supplement any Section 608 certification training program.

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Refrigerant Usage Certification – EPA Section 608

Module 1: Refrigerant Usage Certification

Description:

In 1993, RSES was approved by the EPA to conduct technician certification testing as per EPA regulations. A candidate must pass each of the four question groups (Core, Type I, Type II, Type III) pertaining to the Type of certification needed. This module covers the Core group. The Core group *must* be taken, and a passing score received, to obtain *any* of the Types of certification.

Learning Outcomes:

Upon the completion of this module, you will be able to:

1. Describe how the ozone layer is formed in the stratosphere and the troposphere.
2. Describe why the ozone layer is thinning over Antarctica.
3. Explain how CFCs cause ozone destruction.
4. Describe the characteristics that give CFC refrigerants a high ozone depletion potential.
5. Describe the characteristics of HCFC refrigerants and give examples of such refrigerants currently in use.
6. Describe the characteristics of HFC refrigerants, hydrocarbons and halons and give examples of such refrigerants currently in use
7. Describe the effects of ozone depletion on human health.
8. Describe the effects of ozone depletion on crops and on marine life.
9. Explain how stratospheric ozone protection is a global problem.
10. Describe in brief the provisions of the 1987 Montreal Protocol.
11. Describe the U.S. Clean Air Act Amendments.
12. Describe the restrictions placed on HVACR technicians by the regulations in the Clean Air Act.
13. Describe the phase-out schedule for halons, CFCs, and HCFCs.
14. Describe the prohibitions on venting of refrigerants. State the key considerations for developing replacement refrigerants.
15. Describe azeotropes, zeotropes, and near-azeotropes.
16. Describe the key elements of the ASHRAE Standard 15, Safety Code for Mechanical Refrigeration.
17. Describe the features of mineral oils and polyolester oils.
18. Explain how a basic refrigeration system works.
19. Recognize the need to verify the refrigerant being used in an application.
20. Explain how a typical gauge manifold works.
21. Describe some best practices for taking temperature or gauge readings.
22. Explain how temperature-pressure charts help you identify whether a refrigerant is mixed or contaminated by noncondensables.
23. Describe the service procedures involved in case of moisture in a refrigeration system.
24. Define the terms “recover,” “recycle,” and “reclaim.”
25. Describe the three recovery options.
26. Explain the need for EPA approved recovery and recycling equipment.
27. Describe the different types of recovery and recycling equipment, their advantages, and disadvantages.
28. Identify some best practices for the process of recovering refrigerants.
29. Describe the procedure for recovering refrigerants.
30. Describe the guidelines for using system-dependent recovery equipment.
31. Describe the safety rules that should be followed when using recovery equipment.

32. Describe the methods by which system pressure can be raised.
33. Describe the different methods for detecting leaks in a system.
34. Describe some general procedures for detecting leaks.
35. Describe the method for removing moisture from a system.
36. Describe general safety considerations concerning fluorocarbon refrigerants.
37. Describe the kind of safety equipment that should be used when handling refrigerants.
38. Describe the ASHRAE safety classification matrix for refrigerants based on toxicity and flammability ratings.
39. Identify the specifications to which disposable cylinders are built.
40. Explain how the different types of safety relief devices work.
41. Explain the hazards involved in reusing disposable cylinders.
42. Describe the various considerations to be kept in mind when disposing cylinders.
43. Describe the safety guidelines for refrigerant cylinders.
44. Describe the handling guidelines for refrigerant cylinders.
45. Describe the inspections that must be carried out before filling cylinders.
46. Describe the various requirements for shipping procedures.

Topic 1: Ozone Depletion

- Topic Introduction and Objectives
- Stratospheric Ozone
- The Rowland-Molina Theory
- CFCs in the Stratosphere
- Check-Point Question: Causes of Ozone Depletion
- The “Ozone Hole”
- Polar Stratospheric Clouds and Ozone Thinning
- How CFCs Cause Ozone Destruction
- Check-Point Question: How CFCs cause ozone destruction
- Impact of Ozone Depletion
- Ozone Depletion Potential
- Check-Point Question: ODP values
- Topic Summary

Topic 2: Refrigerant Families

- Topic Introduction and Objectives
- Chlorofluorocarbons
- Hydrochlorofluorocarbons
- Hydrofluorocarbons, Hydrocarbons and Halons
- Check-Point Question: The refrigerant family.
- Check-Point Question: The Montreal Protocol and U.S. EPA Regulations
- Topic Summary

Topic 3: Health and Environmental Effects

- Topic Introduction and Objectives
- Risks from Ozone Depletion
- Skin Cancer
- Three Types of Skin Cancer
- Cataracts and Suppression of the Immune System
- Plant and Marine Effects
- Other Impacts
- Stratospheric Ozone Protection—A Global Problem

- Evidence
- Check-Point Question: Risks from Ozone Depletion
- Topic Summary

Topic 4: Controls on CFCs

- Topic Introduction and Objectives
- Early Controls on CFCs
- The Montreal Protocol
- U.S. Clean Air Act Amendments
- Regulations for HVACR Service Technicians
- Penalties and Fines
- Rewards for Reporting Violations
- Check-Point Question: Regulations for HVACR Service Technicians
- Phase-out Schedule
- Prohibition on Venting
- Check-Point Question: Prohibition on Venting
- Topic Summary

Topic 5: Replacement Refrigerants and Oils

- Topic Introduction and Objectives
- Key Considerations for Replacement Refrigerants
- Azeotropes, Zeotropes, and Near-Azeotropes
- Fractionation
- Check-Point Question: Different Types of Blends
- Replacement Refrigerants and System Retrofits
- Approved Refrigerants
- Safety Code for Mechanical Refrigeration
- R-123 and R-134a
- Check-Point Question: ASHRAE Standard 15
- Refrigerant Oils
- Polyolester Oils: Cautionary Notes
- Check-Point Question: Refrigerant Oils
- Topic Summary

Topic 6: Refrigeration Cycle

- Topic Introduction and Objectives
- The Basic Refrigeration System
- Check-Point Question: Refrigeration Cycle
- Refrigerants for Different Applications
- Identifying Refrigerants
- Service Gauges
- Check-Point Question: Working of a Typical Gauge Manifold.
- Refrigerant Temperature-Pressure Charts
- Taking Temperature or Gauge Readings
- Check-Point Question: Temperature-Pressure Chart for Refrigerants
- Service Procedures
- Topic Summary

Topic 7: Recovering, Recycling, and Reclaiming Refrigerants

- Topic Introduction and Objectives
- The Three “Rs”
- Three Recovery Options
- Check-Point Question: The Three Recovery Options
- Check-Point Question: The Three Recovery Options
- Refrigerant Recovery
- Recovery and Recycling Equipments and EPA Requirements
- Check-Point Question: Recovery Equipment
- Designs of Recovery and Recycling Equipment
- Preparing for Refrigerant Recovery
- Guidelines for Refrigerant Recovery
- Handling Recovery Cylinders
- Safety Checks Before Recovery
- Check-Point: Recovering, Recycling, and Reclaiming Refrigerants
- Guidelines for Using System-Dependent Recovery Equipment
- Safety Rules for Recovery Equipment
- Topic Summary

Topic 8: Leak Detection

- Topic Introduction and Objectives
- Leak Testing and System Pressure
- Raising Low-Side Pressure
- Mixing Dry Nitrogen and HCFCs
- Check-Point Question: Raising System Pressure
- Leak Testing Methods
- General Procedures for Detecting Leaks
- Dehydration
- Check-Point Question: Leak Detection
- Topic Summary

Topic 9: Refrigerant Safety

- Topic Introduction and Objectives
- Health Hazards and Precautions
- Check-Point Question: General Safety Considerations
- Safety Equipments
- ASHRAE Standard 34
- Check-Point Question: Safety Matrix
- Topic Summary

Topic 10: Refrigerant Cylinders

- Topic Introduction and Objectives
- Refrigerant Cylinder Color Codes
- Regulations
- Safety Relief Devices
- Overpressurized Cylinders
- Check-Point Question: Refrigerant Cylinders
- Hazards of Reuse
- Disposal
- Safety Guidelines
- Deposit Containers

- Handling Cylinders
- Check-Point Question: Handling Cylinders
- Filling the Cylinder
- Check-Point Question: Test Date
- Shipping Procedures
- Shipping Used Refrigerants Classified as Hazardous Waste
- Typical Requirements and Procedures
- Topic Summary
- Assessment

Module 2: Type I–Small Appliances

Description:

This module is designed to help technicians understand the information necessary for obtaining Type I certification. Many of the questions for the Type I exam cover information that is covered in the "Core" module. But some of the information covered in this module is unique to Type I.

Learning Outcomes:

Upon the completion of this module, you will be able to:

1. Define various terms as they apply to Type I certification.
2. Explain some of the service requirements for small appliance refrigeration systems. Explain the need to identify refrigerants before recovery in small appliances.
3. Differentiate between system-dependent and self-contained recovery equipment.
4. Describe the techniques and requirements for refrigerant recovery in small appliances.
5. Explain the refrigeration cycle for small appliances.
6. Describe the safety guidelines that must be followed when recovering refrigerants

Topic 1: Definitions

- Topic Introduction and Objectives
- Definitions
- Further Definitions
- "Hermetically Sealed" Systems
- Check-Point Question: Definitions
- Topic Summary

Topic 2: Refrigerant Recovery

- Topic Introduction and Objectives
- Identifying Refrigerants Before Recovery
- System-Dependent Recovery Equipment and Self-Contained Recovery Equipment
- Recovery Techniques
- Recovery Requirements: System-Dependent Equipment
- Recovery Requirements: Self-Contained Equipment
- Check-Point Question: Refrigerant Recovery
- Topic Summary

Topic 3: Refrigeration Cycle and Safety

- Topic Introduction and Objectives
- Refrigeration Cycle
- Safety
- Check-point Question: Refrigeration Cycle
- Check-point Question: Refrigeration Cycle
- Topic Summary
- Assessment

Module 3: Type II—High-Pressure Systems

Description:

This module is designed to help technicians understand the information necessary for obtaining Type II certification. Type II classification certifies a technician for refrigerant service of high-pressure and very high-pressure appliances. He can then also purchase refrigerants. Many of the questions for the Type II exam cover information that is covered in the "Core" module. But some of the information covered in this module is unique to Type II.

Learning Outcomes:

1. Identify signs of a leak in high-pressure and very high-pressure systems.
2. Describe the repair requirements for high-pressure and very high-pressure systems.
3. Describe the techniques for recovering refrigerants in high-pressure and very high-pressure systems.
4. Describe the EPA regulations governing recovery equipment and vacuum standards for high-pressure and very high-pressure systems.
5. Describe the components of a high-pressure appliance.
6. Explain the flow of refrigerant through high-pressure and very high-pressure systems.
7. Explain the role of the different components in high-pressure and very high-pressure systems.
8. Describe the general safety practices when working with refrigeration systems.
9. Describe the safety practices when working with high-pressure systems.

Topic 1: Leak Detection

- Topic Introduction and Objectives
- Definitions
- Leak Detection in High-Pressure/Very High-Pressure Systems
- Repair Requirements
- Check-Point Question: Leak Detection
- Topic Summary

Topic 2: Refrigerant Recovery

- Topic Introduction and Objectives
- Maintenance of Recovery Machines
- Removing Refrigerant in the Liquid Phase
- Recovering Vapor from the Appliance
- Recovery Requirements
- Check-Point Question: Refrigerant Recovery
- Topic Summary

Topic 3: Refrigeration Cycle

- Topic Introduction and Objectives
- Flow of Refrigerant Through the Appliance
- Vacuum Pump
- Check-Point Question: Refrigeration Cycle
- Check-Point Question: Refrigeration Cycle
- Topic Summary

Topic 4: Safety

- Topic Introduction and Objectives
- General Safety Practices
- Safety Reminders for Large Appliances
- Check-Point Question: Safety
- Topic Summary
- Assessment

Module 4: Type III—Low-Pressure Systems

Description:

The Type III classification certifies a technician for refrigerant service of low-pressure appliances. He can then also purchase refrigerants. This module is designed to help technicians understand the information necessary for obtaining Type III certification. Many of the questions for the Type III exam cover information that is covered in the "Core" module. But some of the information covered in this module is unique to Type III.

Learning Outcomes:

1. Describe the guidelines for leak testing in low-pressure systems.
2. Explain how different components in low-pressure systems work.
3. Explain how cooling takes place in low-pressure systems.
4. Describe the techniques for recovering refrigerants from low-pressure systems.
5. Describe the requirements for recovering refrigerants from low-pressure systems.
6. Describe the techniques for charging refrigerants in large low-pressure systems.
7. Describe the refrigeration cycle in large low-pressure systems.
8. Describe the safety precautions that technicians should follow when handling refrigerants in low-pressure systems.

Topic 1: Leak Detection

- Topic Introduction and Objectives
- Leak Testing Low-Pressure Systems
- Overpressure in Low-Pressure Systems
- Purge Units in Low-Pressure Systems
- How Cooling Takes Place
- Check-Point Question: Low-Pressure Systems
- Check-Point Question: Low-Pressure Systems
- Topic Summary

Topic 2: Recovering and Recharging Techniques

- Topic Introduction and Objectives
- Recovering Refrigerants from Chillers
- Recovery Requirements
- System Evacuations
- Recovery and Recycling Equipment
- Charging Liquid Refrigerants
- Check-Point Question: Recovering and Recharging Techniques
- Topic Summary

Topic 3: Refrigeration Cycle and Safety in Low-Pressure Systems

- Topic Introduction and Objectives
- Refrigeration Cycle for Low-Pressure Systems
- Check-Point Question: Refrigeration Cycle and Safety in Low-Pressure Systems
- Personal Safety
- Check-Point Question: Refrigeration Cycle and Safety in Low-Pressure Systems
- Topic Summary
- Assessment